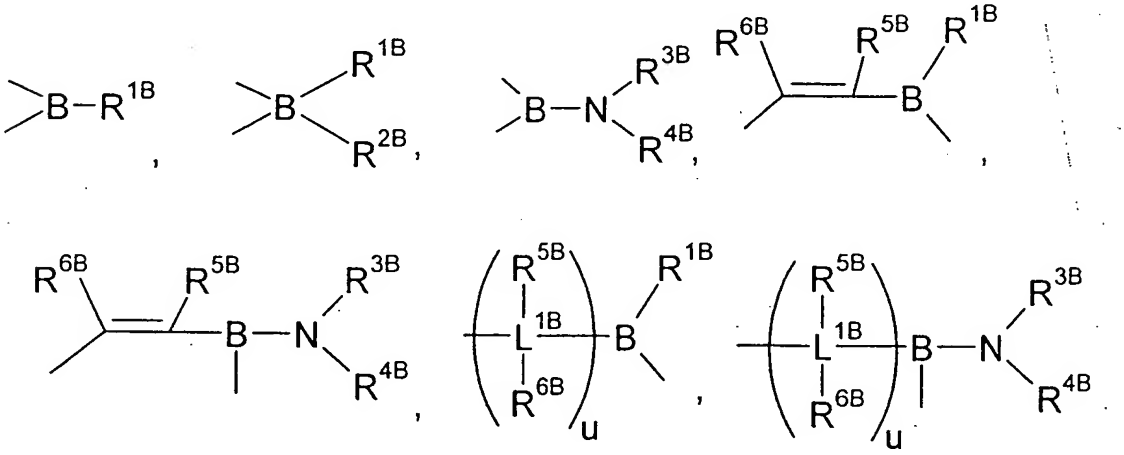
CLAIMS - LU6047
Shahram MIHAN

1. (original) A monocyclopentadienyl complex in which the cyclopentadienyl system bears at least one uncharged donor bound via a boron-containing bridge and comprising one or more atoms of group 15 and/or 16 of the Periodic Table of the Elements and is bound to a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten.

2. (original) A monocyclopentadienyl complex as claimed in claim 1 which comprises the following structural feature of the formula $(Cp)(-Z-A)_mM(I)$, where the variables have the following meanings:

Cp is a cyclopentadienyl system,

Z is a divalent bridge between A and Cp selected from the group consisting of



where

L^{1B} are each, independently of one another, carbon or silicon,

R^{1B}-R^{6B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{7B}_3, where the organic radicals R^{1B}-R^{6B} may also be substituted by halogens and two geminal or vicinal radicals R^{1B}-R^{6B} may also be joined to form a five- or six-membered ring and

R^{7B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical and two radicals R^{7B} may also be joined to form a five- or six-membered ring,

u is 1, 2 or 3,

A is an uncharged donor group containing one or more atoms of group 15 and/or 16 of the Periodic Table of the Elements,

M is a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten and

m is 1, 2 or 3.

3. (currently amended) A monocyclopentadienyl complex as claimed in claim 1 ~~or 2~~ of the formula $(Cp)(-Z-A)_mMX_k$ (V), where the variables have the following meanings:

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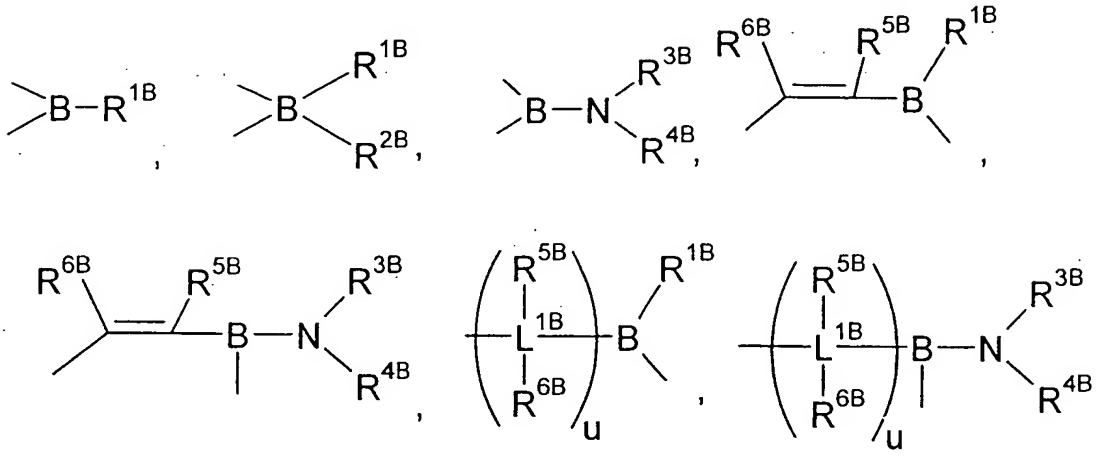


where

L^{1B} are each, independently of one another, carbon or silicon,

R^{1B}-R^{6B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{7B}_3, where the organic radicals R^{1B}-R^{6B} may also be substituted by halogens and two geminal or vicinal radicals R^{1B}-R^{6B} may also be

joined to form a five- or six-membered ring and

R^{7B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical and two radicals R^{7B} may also be joined to form a five- or six-membered ring,

u is 1, 2 or 3,

A is an uncharged donor group containing one or more atoms of group 15 and/or 16 of the Periodic Table of the Elements,

M is a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten,

m is 1, 2 or 3,

X are each, independently of one another, fluorine, chlorine, bromine, iodine, hydrogen, C_1-C_{10}-alkyl, C_2-C_{10}-alkenyl, C_6-C_{20}-aryl, alkylaryl having 1-10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^1R^2, OR^1, SR^1, SO_3R^1, $OC(O)R^1$, CN, SCN, β-diketonate, CO, BF_4^-, PF_6^- or a bulky noncoordinating anion,

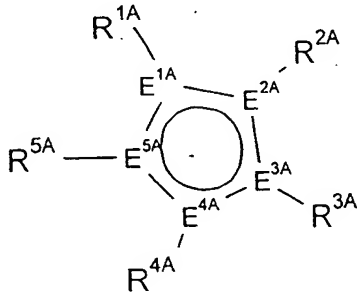
R^1-R^2 are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, SiR^3_3, where the organic radicals R^1-R^2 may also be substituted by

halogens and two radicals R^1-R^2 may also be joined to form a five- or six-membered ring,

R^3 are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^3 may also be joined to form a five- or six-membered ring and

k is 1, 2, or 3.

4. (currently amended) A monocyclopentadienyl complex as claimed in claim 2 ~~or~~ 3, wherein the cyclopentadienyl system Cp has the formula (II):



(II)

where the variables have the following meanings:

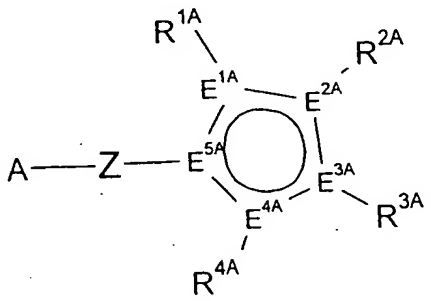
E^{1A}-E^{5A} are each carbon or at most one E^{1A}-E^{5A} is phosphorus,

R^{1A}-R^{5A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2,

$N(SiR^{6A}_3)_2$, OR^{6A}, $OSiR^{6A}$, $OSiR^{6A}_3$, SiR^{6A}_3, BR^{6A}_2, where the organic radicals R^{1A}-R^{5A} may also be substituted by halogens and two vicinal radicals R^{1A}-R^{5A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{5A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S, with 1, 2 or 3 substituents, preferably 1 substituent, R^{1A}-R^{5A} being a group -Z-A, and

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring.

5. (currently amended) A monocyclopentadienyl complex as claimed in ~~any of claims 2 to 4~~ claim 2, wherein the cyclopentadienyl system Cp together with –Z-A has the formula (IV):



(IV)

where the variables have the following meanings:

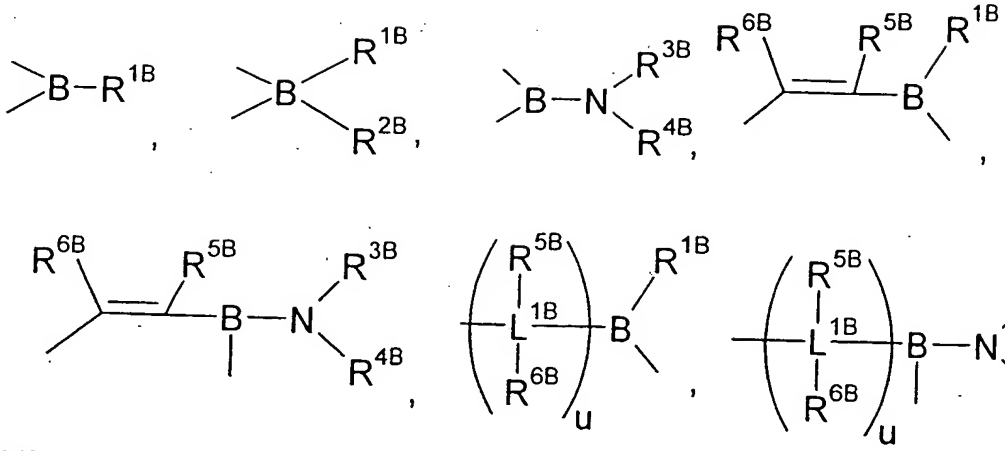
E^{1A}-E^{5A} are each carbon or at most one E^{1A} to E^{5A} is phosphorus,

R^{1A}-R^{4A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2, $N(SiR^{6A}_3)_2$, OR^{6A}, $OSiR^{6A}_3$, SiR^{6A}_3, BR^{6A}_2, where the organic radicals R^{1A}-R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A}-R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

A is a donor group containing one or more atoms of group 15 and/or 16 of the Periodic Table of the Elements,

Z is a divalent bridge between A and Cp selected from the group consisting of



where

L^{1B} are each, independently of one another, carbon or silicon,

R^{1B}-R^{6B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part of SiR^{7B}_3, where the organic radicals R^{1B}-R^{6B} may also be substituted by halogens and two geminal or vicinal radicals R^{1B}-R^{6B} may also be joined to form a five- or six-membered ring and

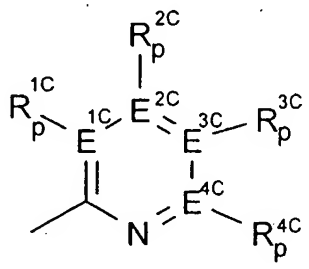
R^{7B} are each, independently of one anther, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical and two radicals R^{7B} may also be joined to form a five- or six-membered ring and

u is 1, 2 or 3.

6. (currently amended) A monocyclopentadienyl complex as claimed in ~~any of~~

~~claims 2 to 5~~ claim 2, wherein A is an unsubstituted, substituted or fused, heteroaromatic ring system.

7. (currently amended) A monocyclopentadienyl complex as claimed in ~~any of~~ ~~claims 2 to 6~~ claim 2, wherein A has the formula (III):



(III)

where the variables have the following meanings:

E^{1C}-E^{4C} are each carbon or nitrogen,

R^{1C}-R^{4C} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or $SiR^{5C}3$, where the organic radicals R^{1C}-R^{4C} may also be substituted by halogens or nitrogen and further C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 groups and two vicinal radicals R^{1C}-R^{4C} or R^{1C} and Z may also be joined to form a five- or six membered ring,

R^{5c} are each, independently of one anther, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{5C} may also be joined to form a five- or six membered ring and

p is 0 when E^{1C}-E^{4C} is nitrogen and 1 when E^{1C}-E^{4C} is carbon.

8. (currently amended) A monocyclopentadienyl complex as claimed in ~~any of claims 1 to 7~~ claim 1, wherein Z is selected from the group consisting of BR^{1B}, $BNR^{3B}R^{4B}$, $C(R^{5B}R^{6B})$-BR^{1B} and $C(R^{5B}R^{6B})$-$BNR^{3B}R^{4B}$.

9. (currently amended) A monocyclopentadienyl complex as claimed in ~~any of claims 1 to 8~~ claim 1, wherein M is chromium.

10. (currently amended) A catalyst system for olefin polymerization comprising

A) at least one monocyclopentadienyl complex as claimed in ~~any of claims 1 to 9~~ claim 1,

B) optionally, an organic or inorganic support,

C) optionally, one or more activating compound,

D) optionally, one or more catalysts suitable for olefin polymerization and

E) optionally, one or more metal compounds containing a metal of group 1, 2 or 13 of the Periodic Table.

11. (original) A prepolymerized catalyst system comprising a catalyst system as claimed in claim 10 and one or more linear C_2-C_{10}-1-alkenes polymerized onto it

in a mass ratio of from 1:0.1 to 1:1 000 based on the catalyst system.

12. (canceled)

13. (currently amended) A process for preparing polyolefins by polymerization or copolymerization of olefins in the presence of a catalyst system as claimed in claim 10 ~~or 11~~.